ANNUAL REPORT FOR 2000

Lengyel Mitigation Site
Craven County
Project No. 8.1170806
TIP No. B-2531WM

Prepared By:
Natural Systems Unit & Roadside Environmental Unit
North Carolina Department of Transportation
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SUMMARY

The following report summarizes the monitoring activities that have occurred in the second year of monitoring for hydrology and vegetation at the Lengyel Mitigation Site. Since the first monitoring report, the success criteria for vegetation sampling have changed to reflect the most recent guidelines from the National Marine Fisheries Service. These changes include: 1) the average of all plots should have a 75 percent vegetative cover consisting of wetland herbaceous species, not including any invasive species, and 2) a minimum of 70 percent of the plots will contain the target (planted) wetland species. This was changed in concurrence with NCDWQ, USACE, and CAMA. Additionally, two groundwater gauges were installed at the site on October 2, 2000.

The Lengyel Mitigation Site is a brackish marsh restoration/preservation site divided into two areas. The first area is a reference marsh ecosystem (preservation) that contains surfacewater gauges LSG-3 and LSG-4, and groundwater gauge LSGW-2. The second area is a restoration site that contains surface water gauges LSG-1 and LSG-2, and groundwater gauge LSGW-1.

Hydrology data were not collected for the entire 2000 growing season for any of the surface water or groundwater gauges. These data gaps are attributed to gauge malfunction (LSG-1 and LSG-4), failure to collect the data (LSG-1, LSG-2, LSG-3, and LSG-4), and installation of gauges after the growing season began (LSGW-1 and LSGW-2). Despite the observed data gaps, the success criterion was still met for hydrology for all four surface water gauges. Additionally, groundwater was observed within 12 inches of the ground surface continuously for both groundwater gauges. Monitoring of these two gauges began on October 3, 2000.

Vegetation data met one of the two success criteria established for the Lengyel Site. The overall plot average did not meet the required 75% (Scale 5) coverage criteria. The site did, however, meet the 70% percentage frequency of the target specie.

Additional observations include the siting of ospreys on the nesting pole and the presence of crabs and other aquatic organisms in the constructed tidal swale. Based on the successful monitoring results from the 2000 growing season, NCDOT recommends the continued monitoring of the Lengyel Mitigation Site.

1.0 INTRODUCTION

1.1 Project Description

The Lengyel Mitigation Site is a 13.198 acre brackish marsh restoration/preservation project located in Craven County, North Carolina. The site is located east of the intersection of US 70 and US 70 Business and provides compensatory mitigation for impacts associated with the construction of the US 17 Neuse River Bridge (TIP No. B-2531) (Figure 1). Mitigation goals for the site include approximately 6.54 acres of brackish marsh restoration, 5.25 acres of brackish marsh preservation, and 0.85 acres of upland buffer.

1.2 Purpose

In order to demonstrate successful mitigation, the Lengyel site is monitored for hydrology and vegetation. The year 2000 marks the second year of monitoring for the site. Monitoring of wetland restoration efforts will be performed until success criteria are fulfilled. The following report describes the results of both hydrologic and vegetation monitoring for 2000.

1.3 Project History

April 1998	Site Construction Began
April 1998	Site planted (Phase I)
March 1999	Surface Water Gauges Installed
April 1999	Hydrologic Monitoring (begin)
April 1999	Planting Completed
June 1999	Site Construction Finished
October 1999	Vegetation Monitoring (1 yr.)
November 1999	First Year Hydrologic Monitoring (end)
March 2000	Second Year Hydrologic Monitoring (begin)
August 2000	Vegetation Monitoring (2 yr.)
October 2000	Two Groundwater Gauges Installed
November 2000	Second Year Hydrologic Monitoring (end)

FIGURE 1: LENGYEL SITE LOCATION MAP


Trent River
Neuse River
Lengyel Mitigation Site
70
1004
SSR 1004
SSR 1167
MAPLE
James City
JOHN
SCOTT
ELLIOT
BROWN
SSR 1138
DUDLEY
SSR 1137
FOREMAN
GUM
SSR 1135
SSR 1139
SSR 1149
SSR 1113
SSR 1155
SSR 1134
LAUGHINGHOUSE
SUSAN
CASEY RD
DOUGLAS
VERNON

2.0 HYDROLOGY

2.1 Success Criteria

The hydrologic success criteria established for the Lengyel Mitigation Site include: 1) site inundation or saturation within 12 inches of the ground surface for 25 percent of the growing season, or should the restoration fail to meet this criteria, 2) statistical comparison between the reference marsh area and the restoration area to determine if hydrology is significantly different. The site specific criteria are more stringent than the current federal guidelines that require a site to be inundated or saturated (within 12" of the surface) by surface or groundwater for a consecutive 5-12.5% of the growing season. Areas inundated or saturated less than 5% of the growing season are classified as non-wetlands.

The growing season in Craven County begins on March 18 and ends November 14. These dates correspond to a 50% probability that air temperature will drop to 28° F or lower after March 18 and before November 14.[1] Thus the growing season is 240 days; the established minimum hydrology requires 25% of this season, or 60 days. Local climate must represent average conditions for the area.

2.2 Hydrologic Description

Because the marsh is expected to be inundated because of highwater, wave action, wind-driven tides, and rainfall, surface gauges were installed to record surface water levels. Four surface water gauges were installed at the site on March 31, 1999 (Figure 2). Automatic readings are taken at three-hour intervals daily throughout the growing season. Two additional groundwater gauges were installed on October 2, 2000 to maintain compliance with the CAMA, USACE, and NCDWQ permit conditions. Automatic readings are also taken every three hours.

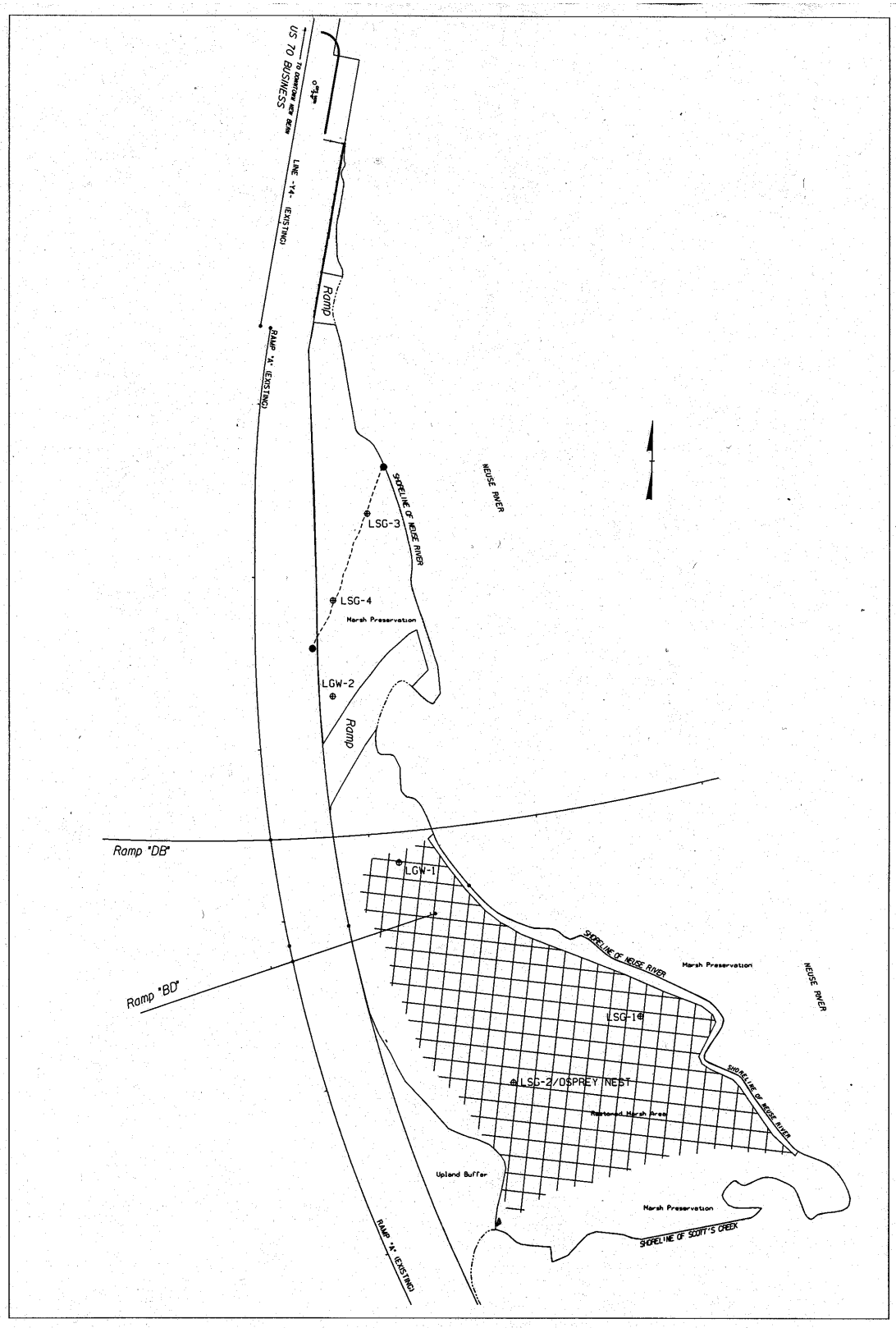
2.3 Results of Hydrologic Monitoring

2.3.1 Site Data

Continuous site inundation or saturation was observed for all six gauges excluding periods of well malfunction, missed data collection, or absence of gauge installation. Site inundation exceeded 25 percent of the growing season.

[1] Soil Conservation Service, Soil Survey of Craven County, North Carolina, 1989.

FIGURE 2: MONITORING GAUGE LOCATIONS



Appendix A contains a plot of the water depth for each surface and groundwater gauge. The hydrology monitoring data starts on March 18, 2000 and ends on November 14, 2000.

Specific Gauge Problems:

Gauge LSG-1: Gauge stopped recording on 9/13/00, battery replaced on 9/23/00; data not downloaded from 9/23/00–10/5/00.

Gauge LSG-2: Gauge data not downloaded from 9/23/00–10/5/00.

Gauge LSG-3: Gauge data not downloaded from 9/23/00-10/5/00.

Gauge LSG-4: Gauge was replaced on 2/12/00; stopped recording on 2/25/00, batteries replaced on 2/26/00; stopped recording on 3/24/00, batteries replaced on 3/25/00; stop recording on 4/21/00, gauge replaced on 5/20/00; stopped recording on 6/23/00,reset on 6/24/0; data not downloaded from 9/23/00–10/5/00.

2.3.2 Climatic Data

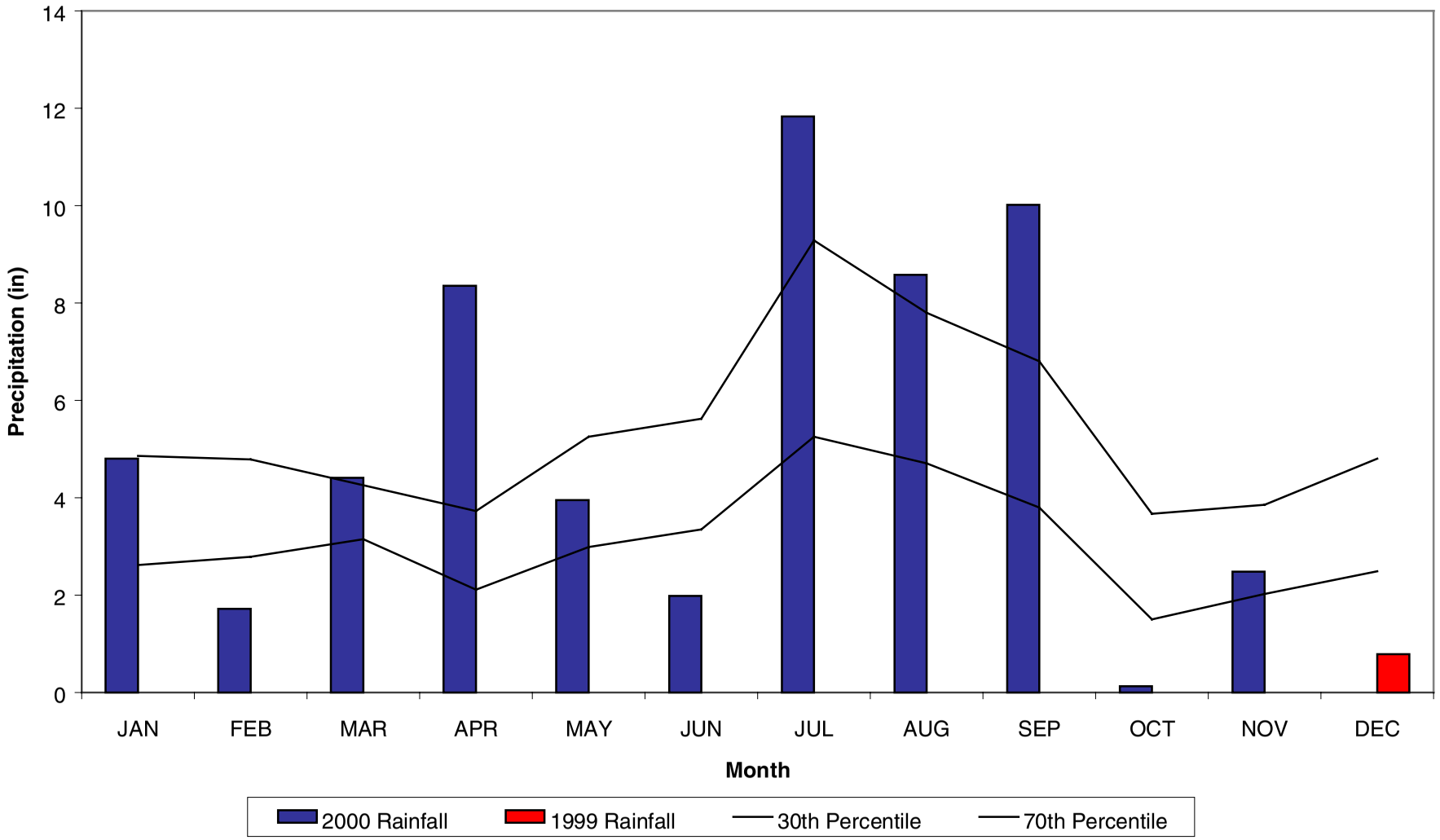
Figure 3 is a comparison of the 2000 monthly precipitation to the historical precipitation for New Bern, North Carolina. The two lines depicted represent the 30th and 70th percentiles for precipitation data collected in New Bern between the years of 1931 and 2000. The blue bars represent 2000 monthly precipitation totals while the red bar represents 1999 monthly precipitation totals. Because of data availability, the 2000 data encompasses only data collected from January 1 to November 30, 2000. The data was provided by the NC State Climate Office.

This graph is used to indicate the general precipitation conditions for the surrounding area. The data obtained indicates lower than normal precipitation for three months and above average precipitation for three months of the year 2000. The sum precipitation measured from January 1 through November 30, 2000 was 61.21 inches, which is within the normal 30 year (1961-1990) average rainfall for the New Bern area.

2.4 Conclusions

The year 2000 represents the second year of hydrologic monitoring for the Lengyel Mitigation Site. Surface water indicated continuous site inundation for a period exceeding 25 percent of the growing season. Hydrology data collected for groundwater gauges showed continuous saturation for the period monitored. NCDOT will continue to monitor the site.

Figure 3: 30-70 Percentile Graph



3.0 VEGETATION

3.1 Success Criteria

The vegetative marsh success of the wetland site will be determined in accordance with NMFS Guidelines. Monitoring plots located within the open water channel will not be evaluated, and will not count toward the final count of plots. The vegetation component of the wetland site will be deemed successful if the following criteria are met.

1. At year five, the average of all plots should have a scale value of 5 (75% vegetative cover) consisting of wetland herbaceous species, not including any invasive species.
2. A minimum of 70% of the plots shall contain the target (planted) species.

3.2 Description of Planted Areas

The following plant communities were planted in the Marsh Grass Area:

Marsh Planting: (approximately 2.46 hectares)

Spartina cynosurides, big cordgrass

Table 1. Results of Vegetation Monitoring

ZONE	Plot #	Scale Factor	Spartina cynosurides, Big Cordgrass	Scirpus	Juncus	Frequency (Big Cordgrass ONLY)	Notes
	1	4.0		✔	✔		Sedge
	2	0.0					Open Water
	3	2.0		✔			Baccharis
	4	4.0	✔	✔	✔	✔	
	5	4.0	✔		✔	✔	
	6	5.0	✔	✔	✔	✔	
	7	3.0	✔	✔		✔	Walteria, Aster 4" Surface Water
	8	1.0	✔	✔		✔	Aster, Surface Wet
	9	2.0	✔	✔	✔	✔	
	10	5.0	✔		✔	✔	Willow
	11	2.0	✔	✔		✔	Marsh Fleabane, 10" Surface Water
	12	0.5	✔			✔	Aster, 2" Surface Water
	13	0.0					Aster
	14	0.5	✔			✔	Walteria 2" Surface Water
	15	5.0	✔	✔		✔	Willow
	16	3.0	✔	✔	✔	✔	Aster, Walteria
	17	3.0	✔		✔	✔	Aster 6" Surface Water
	18	2.0	✔	✔		✔	Aster, 6" Surface Water
	19	3.0	✔	✔		✔	Aster, 3" Surface Water
	20	0.0					Open Water
	21	2.0	✔			✔	Aster
	22	3.0	✔		✔	✔	Willow
	23	0.0					Open Water
	24	4.0	✔	✔		✔	Aster
	25	5.0	✔	✔		✔	
	26	4.0	✔	✔	✔	✔	2" Surface Water
	27	5.0	✔	✔		✔	Surface Water
	28	3.0	✔	✔	✔	✔	Baccharis
	29	3.0	✔			✔	Aster, Walteria
	30	4.0	✔	✔		✔	3" Surface Water
	31	2.0	✔	✔		✔	Aster, Willow, 3" Surface Water
	32	2.0	✔	✔		✔	Aster, 6" Surface Water
	33	2.0	✔	✔		✔	Aster, Walteria, 2" Surface Water
	34	5.0		✔	✔		Aster, Surface Wet
	35	4.0	✔	✔	✔	✔	Willow, 1" Surface Water
	36	3.0	✔	✔		✔	Aster
	37	0.0					Open Water
	38	4.0	✔		✔	✔	
	39	2.0	✔	✔	✔	✔	
	40	2.0	✔			✔	
	41	2.0		✔			Aster
	42	2.0	✔			✔	Aster
	43	2.0		✔			Aster
	44	4.0	✔	✔	✔	✔	
	45	3.0		✔			Sedge

ZONE	Plot #	Scale Factor	Spartina cynosurides, Big Cordgrass	Scirpus	Juncus	Frequency (Big Cordgrass ONLY)	Notes
	46	0.0					Open water
	47	4.0					Aster, Umbrella Sedge
	48	3.0	✔	✔		✔	
	49	4.0	✔	✔		✔	Walteria, 1" Surface Water
	50	4.0		✔	✔		Willow, 5" Surface Water
	51	3.0	✔	✔		✔	Aster
	52	2.0			✔		Aster
	53	5.0	✔	✔	✔	✔	1" Surface Water
	54	3.0	✔	✔	✔	✔	Aster, 6" Surface Water
	55	2.0		✔			Aster
	56	4.0	✔	✔		✔	4" Surface Water
	57	4.0	✔	✔		✔	Walteria, Aster
	58	3.0	✔			✔	Aster
	59	4.0	✔		✔	✔	
	60	0.0					Open water
	61	3.0	✔	✔		✔	Marsh Flea bane, Aster
	62	4.0	✔		✔	✔	Black Willow
	63	0.0					Open water
	64	0.0					Open water
	65	5.0	✔	✔	✔	✔	
	66	2.0	✔	✔		✔	3" Surface Water
	67	3.0	✔	✔		✔	Aster, 4" Surface Water
	68	5.0	✔	✔	✔	✔	Seashore mallow
	69	0.0					Marsh Flea bane, Edge Open Water
	70	3.0	✔	✔	✔	✔	
	71	4.0	✔	✔		✔	Aster, 4" Surface Water
	72	2.0	✔			✔	
	73	0.5	✔	✔		✔	Aster, Surface Wet
	74	3.0	✔	✔		✔	Ragweed
	75	4.0	✔	✔	✔	✔	Willow
	76	3.0	✔	✔		✔	Aster
	77	3.0	✔	✔		✔	3" Surface Water
	78	4.0		✔			Flea bane
	79	3.0	✔			✔	Bermuda
	80	1.0		✔			
	81	2.0			✔		Bermuda
	82	0.0					Open water
	83	0.0					Open water
	84	2.0	✔			✔	Aster, Umbrella sedge, 3" Surface Water
	85	0.5	✔			✔	Aster, 8" Surface Water
	86	3.0	✔	✔		✔	
	87	5.0	✔	✔	✔	✔	4" Surface Water
	88	2.0		✔			Aster
	89	3.0	✔			✔	2" Surface Water
	90	5.0	✔		✔	✔	pennywort
Frequency (Percentage of Plots with Desired Specie)			80.0%	68.8%	36.3%	**80.0%**	
Sum Scale Value						**241.0**	
Total Number of Plots						**80.0**	
Vegetative Cover (Scale Value)						**3.0**	

Site Notes: Site continues to establish well. Majority of site is covered with big cordgrass (80% frequency) with 68.8 % frequency of scirpus, 36.3 % frequency of juncus and four plots contain sedges (mostly umbrella sedge). 22 plots contain cattails. Other species seen on site include: duck potato, bottlebush along the edge, marsh flea bane, seashore mallow, cardinal flower, a few cypress, some smartweed, and aster.

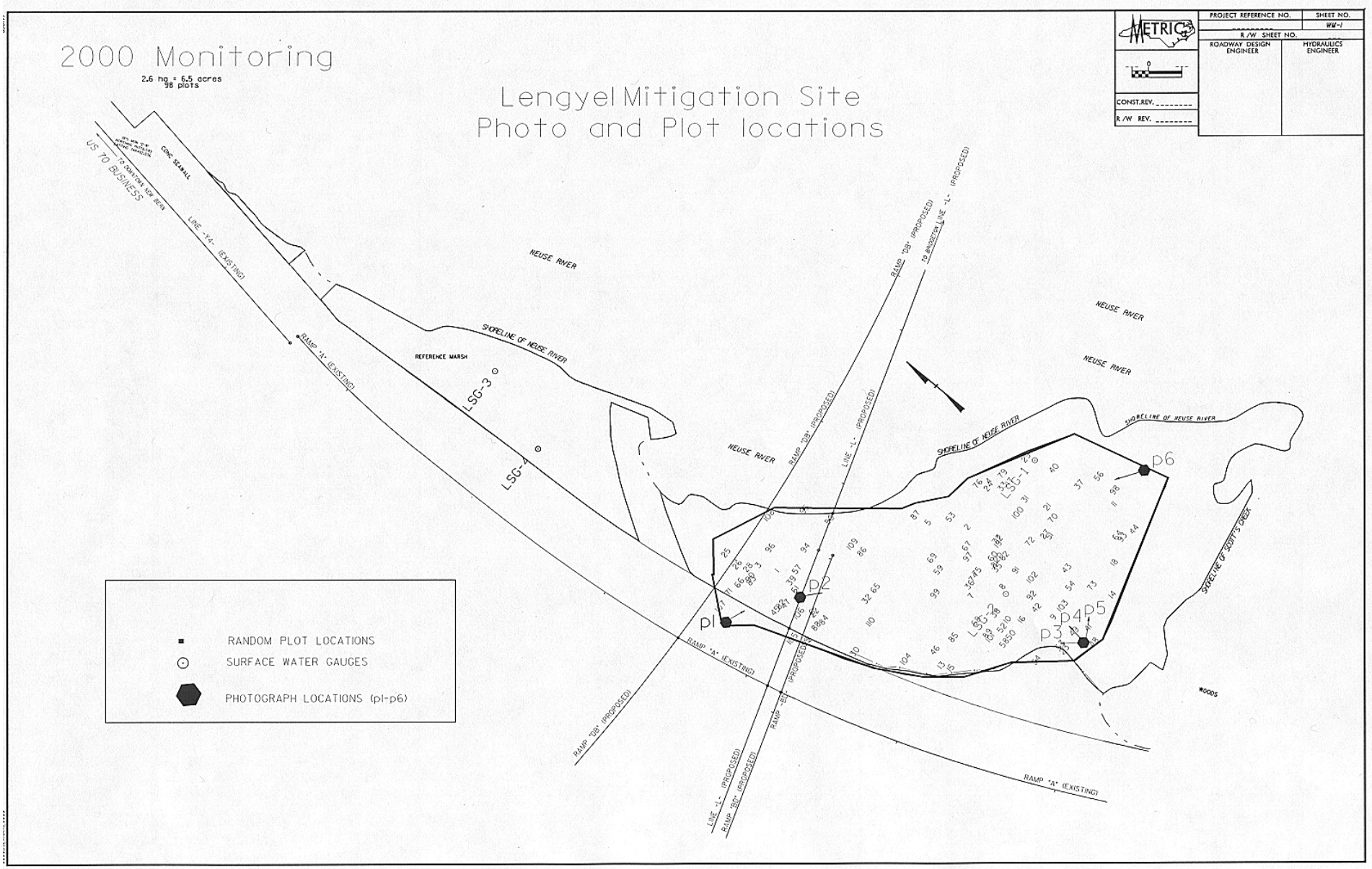
3.4 Conclusions

- Percent Frequency of Target Species (big cordgrass) **80%**
  Frequency of 70% required.
- Vegetative Cover Scale Value **3**
  Scale Value of 5 required for year 5.

Of the 5.34 hectares (13.198 acres) of this site, approximately 2.46 hectares (6.1 acres) involved marsh planting. The percent frequency of target specie exceeds the success criteria. The cover scale value is on target for the second year of monitoring.

No phragmites was observed on site. NCDOT will continue to monitor the site.

Figure 4: Photo and Plot Locations

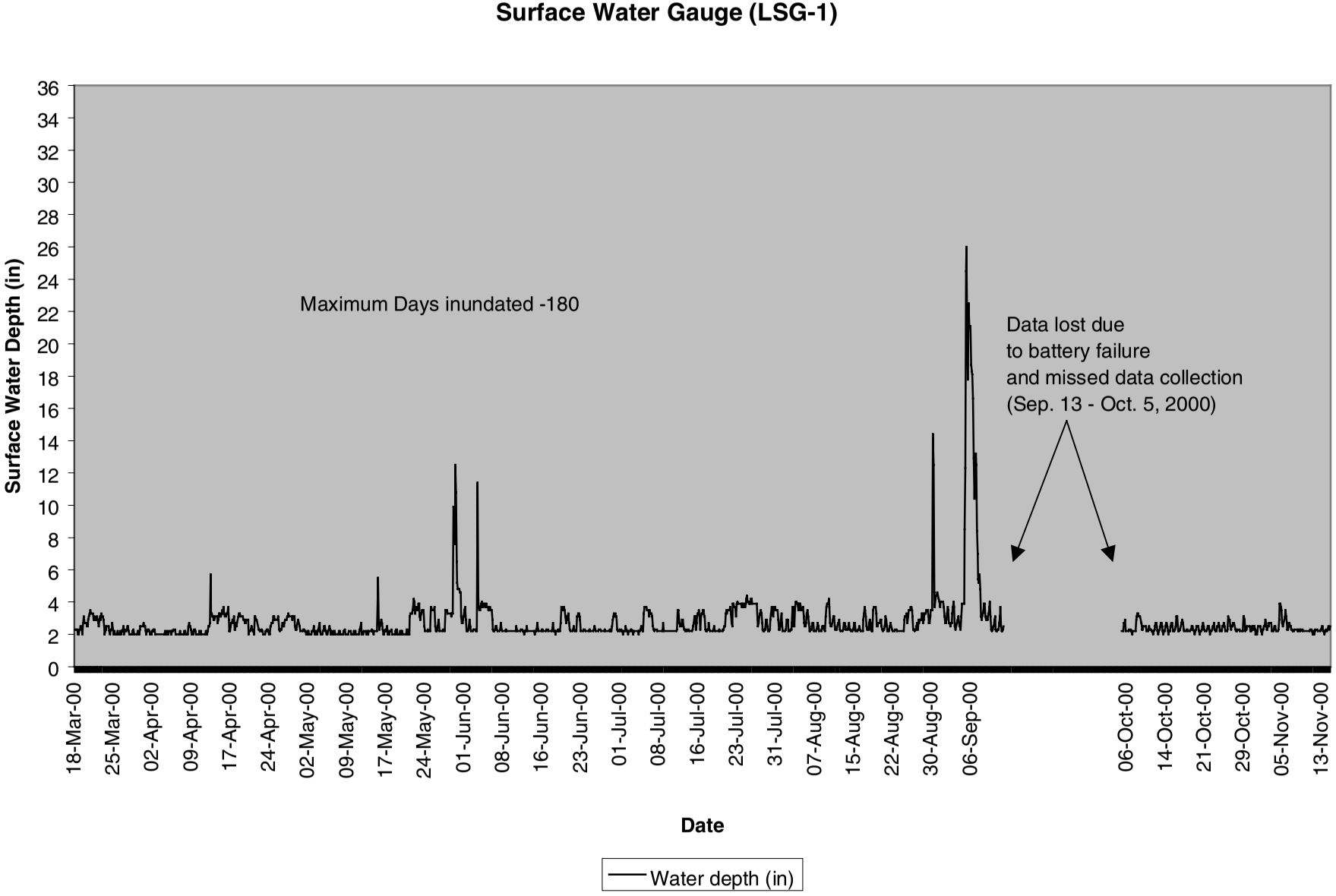


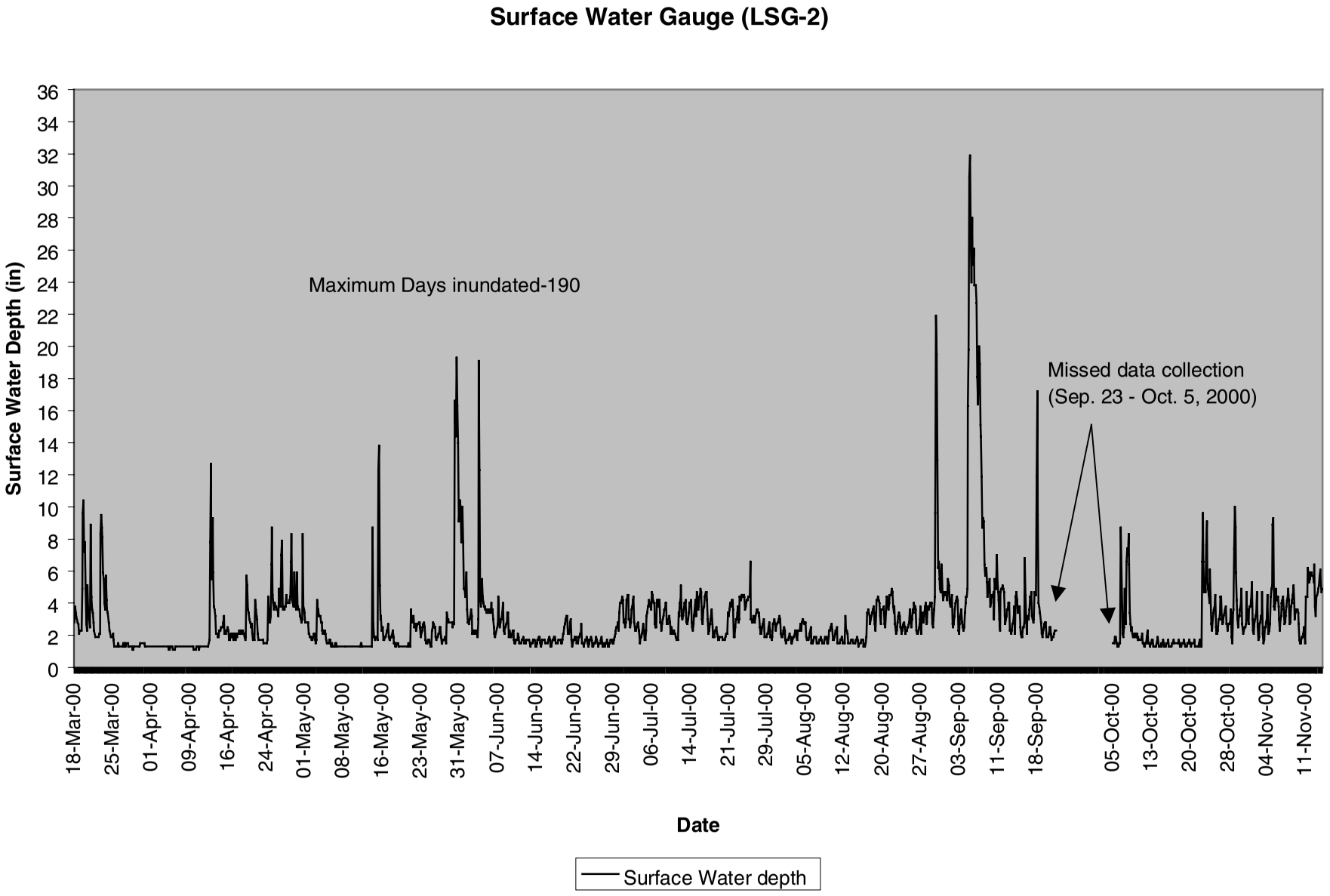
4.0 OVERALL CONCLUSIONS/RECOMMENDATION

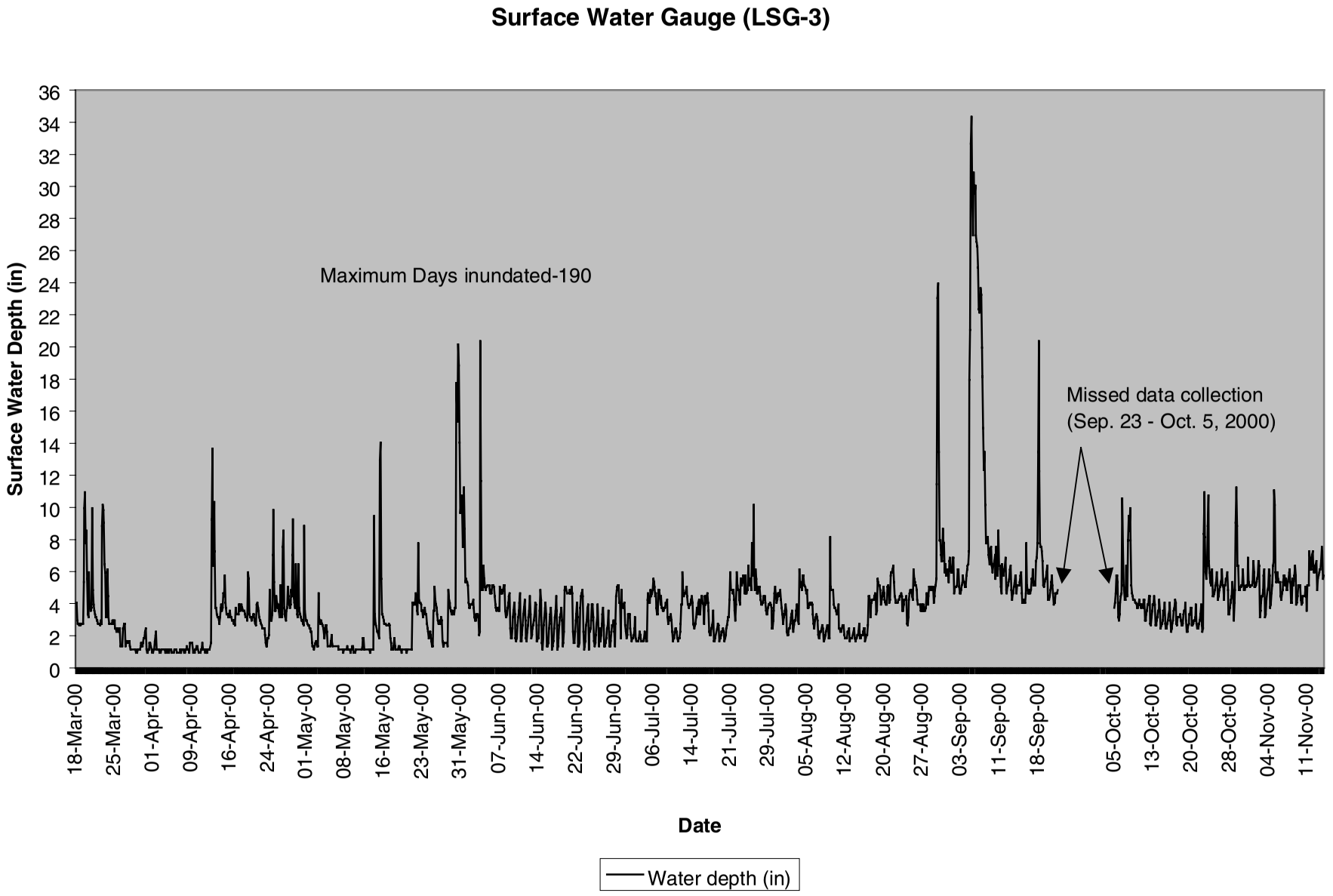
- Hydrology has met the success criteria for the second year.
- Vegetation is currently meeting one of two success criteria for the second year.
- Monitoring should continue for both hydrology and vegetation.

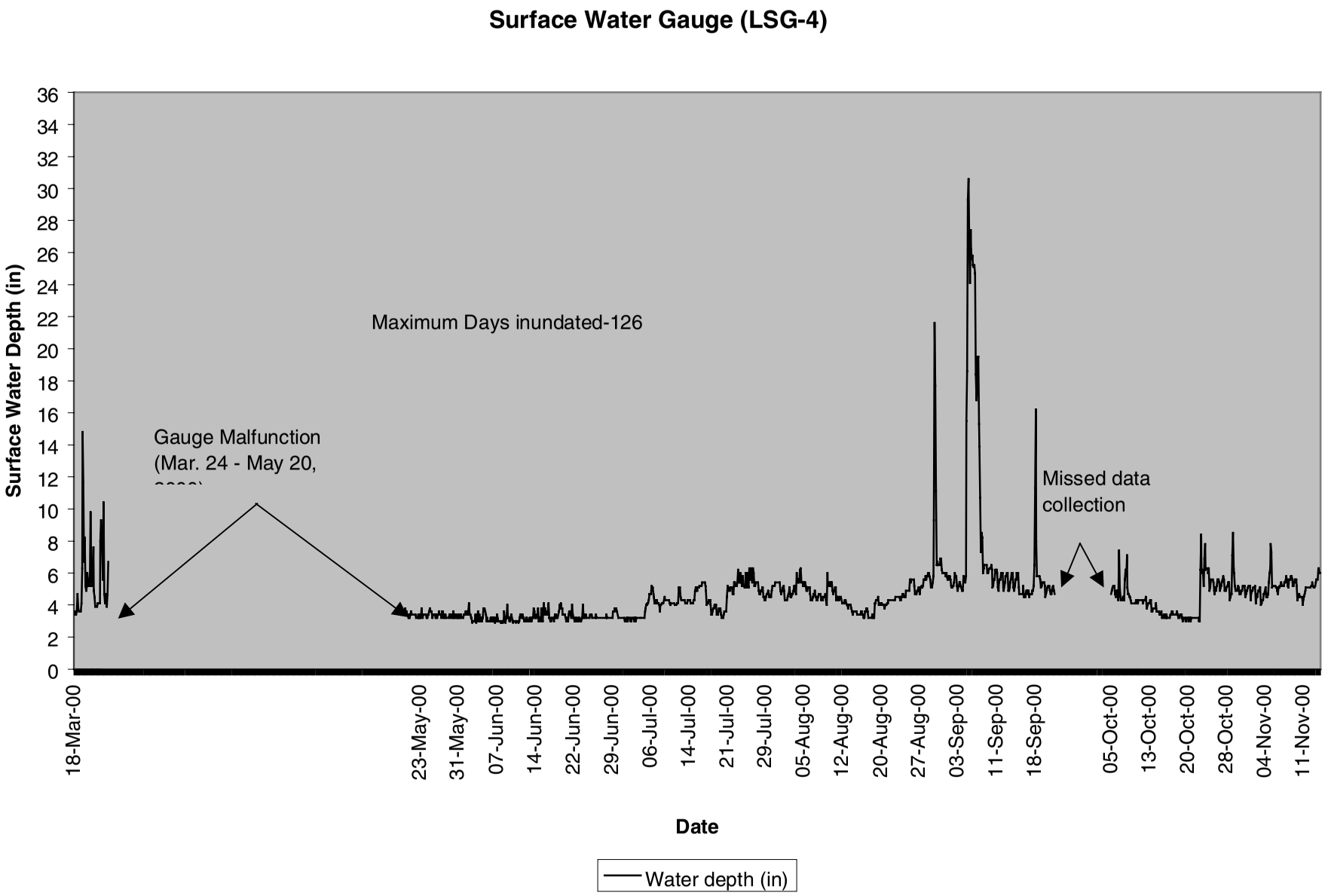
APPENDIX A

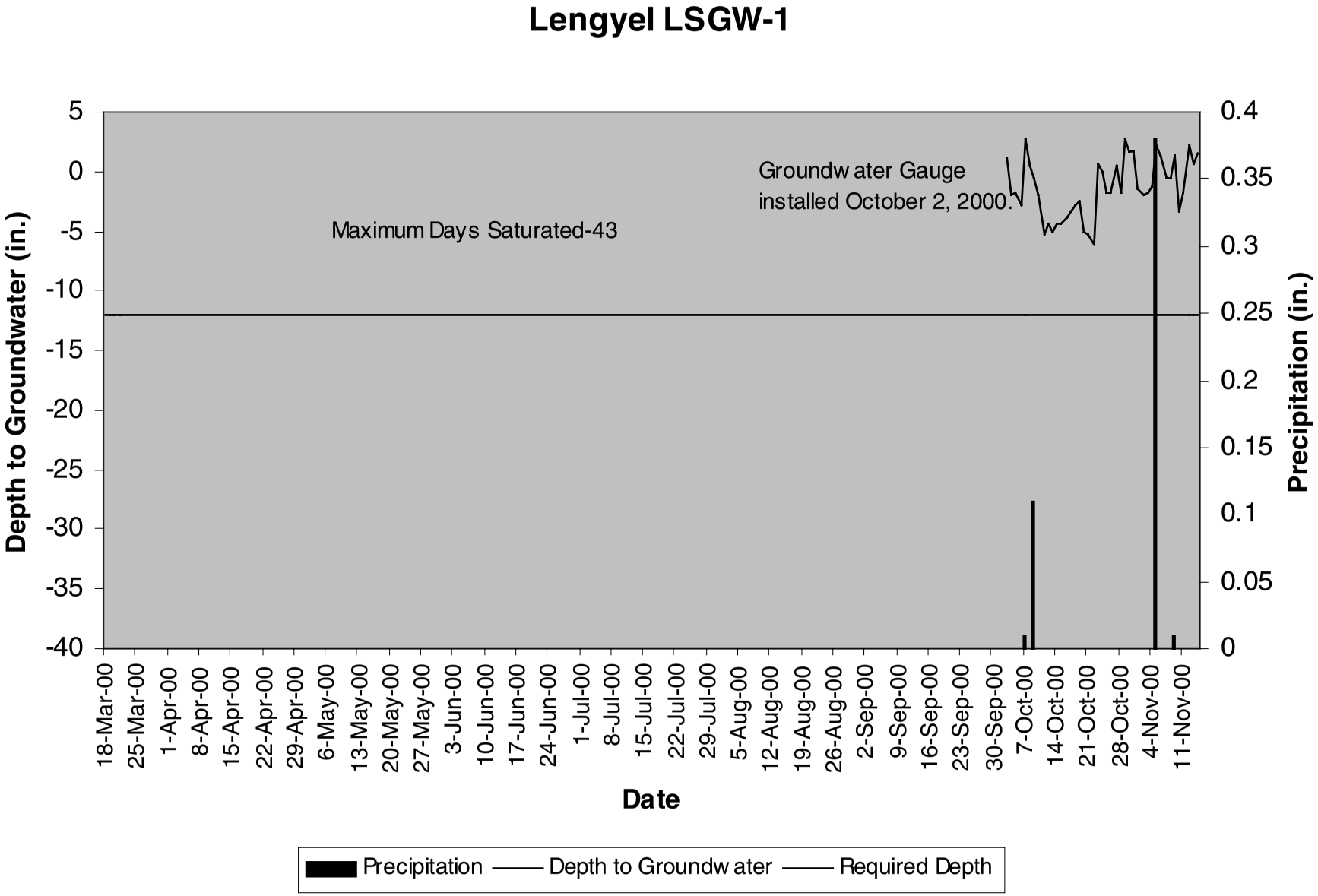
SURFACE AND GROUND WATER HYDROLOGY PLOTS

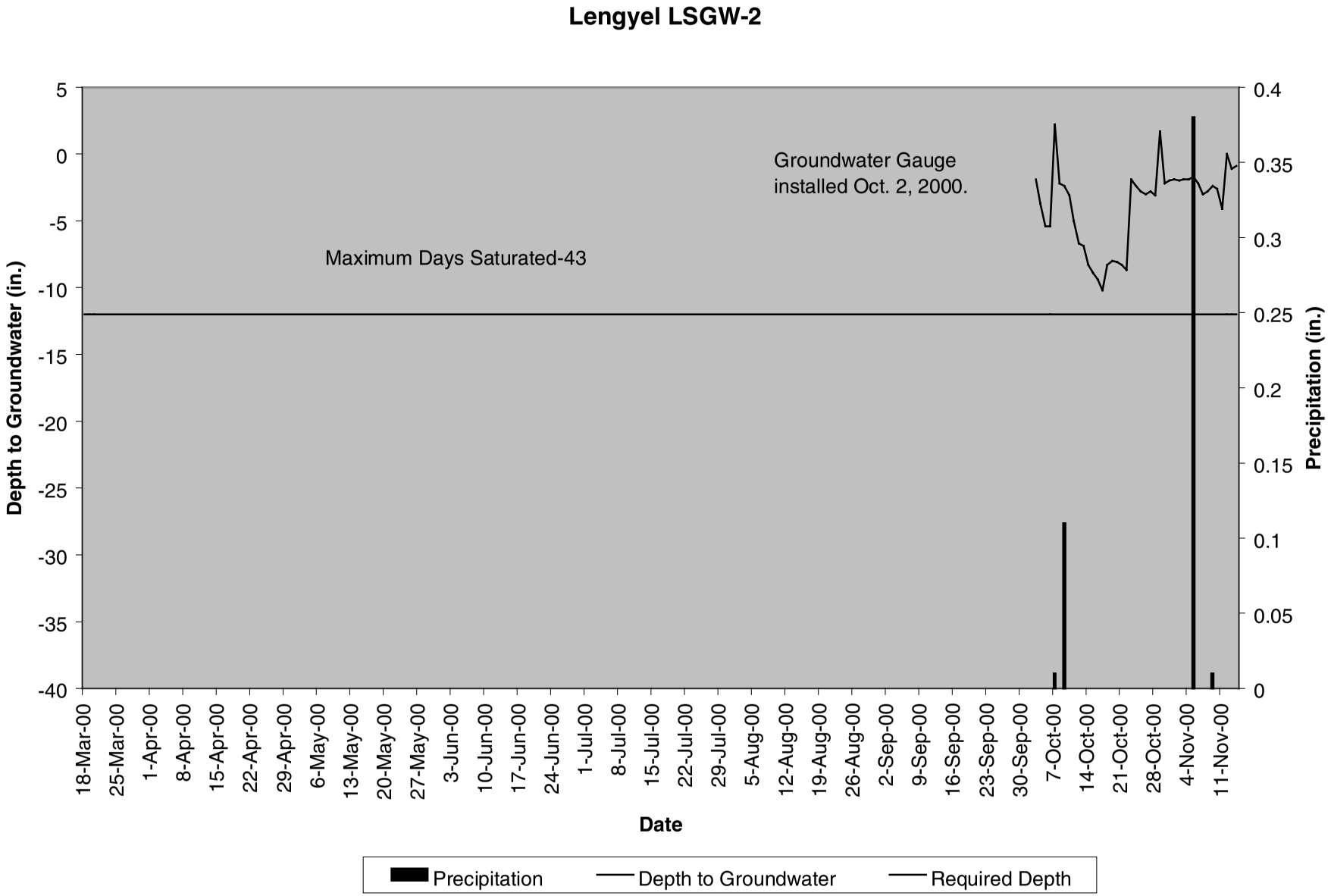

Surface Water Gauge (LSG-1)
Surface Water Depth (in)
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
Maximum Days inundated -180
Data lost due
to battery failure
and missed data collection
(Sep. 13 - Oct. 5, 2000)
18-Mar-00
25-Mar-00
02-Apr-00
09-Apr-00
17-Apr-00
24-Apr-00
02-May-00
09-May-00
17-May-00
24-May-00
01-Jun-00
08-Jun-00
16-Jun-00
23-Jun-00
01-Jul-00
08-Jul-00
16-Jul-00
23-Jul-00
31-Jul-00
07-Aug-00
15-Aug-00
22-Aug-00
30-Aug-00
06-Sep-00
06-Oct-00
14-Oct-00
21-Oct-00
29-Oct-00
05-Nov-00
13-Nov-00
Date
Water depth (in)


Surface Water Gauge (LSG-2)
Surface Water Depth (in)
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
Maximum Days inundated-190
Missed data collection
(Sep. 23 - Oct. 5, 2000)
18-Mar-00
25-Mar-00
01-Apr-00
09-Apr-00
16-Apr-00
24-Apr-00
01-May-00
08-May-00
16-May-00
23-May-00
31-May-00
07-Jun-00
14-Jun-00
22-Jun-00
29-Jun-00
06-Jul-00
14-Jul-00
21-Jul-00
29-Jul-00
05-Aug-00
12-Aug-00
20-Aug-00
27-Aug-00
03-Sep-00
11-Sep-00
18-Sep-00
05-Oct-00
13-Oct-00
20-Oct-00
28-Oct-00
04-Nov-00
11-Nov-00
Date
Surface Water depth


Surface Water Gauge (LSG-3)
Surface Water Depth (in)
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
Maximum Days inundated-190
Missed data collection
(Sep. 23 - Oct. 5, 2000)
18-Mar-00
25-Mar-00
01-Apr-00
09-Apr-00
16-Apr-00
24-Apr-00
01-May-00
08-May-00
16-May-00
23-May-00
31-May-00
07-Jun-00
14-Jun-00
22-Jun-00
29-Jun-00
06-Jul-00
14-Jul-00
21-Jul-00
29-Jul-00
05-Aug-00
12-Aug-00
20-Aug-00
27-Aug-00
03-Sep-00
11-Sep-00
18-Sep-00
05-Oct-00
13-Oct-00
20-Oct-00
28-Oct-00
04-Nov-00
11-Nov-00
Date
Water depth (in)


Surface Water Gauge (LSG-4)
Surface Water Depth (in)
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
Maximum Days inundated-126
Gauge Malfunction
(Mar. 24 - May 20,
Missed data
collection
18-Mar-00
23-May-00
31-May-00
07-Jun-00
14-Jun-00
22-Jun-00
29-Jun-00
06-Jul-00
14-Jul-00
21-Jul-00
29-Jul-00
05-Aug-00
12-Aug-00
20-Aug-00
27-Aug-00
03-Sep-00
11-Sep-00
18-Sep-00
05-Oct-00
13-Oct-00
20-Oct-00
28-Oct-00
04-Nov-00
11-Nov-00
Date
Water depth (in)


Lengyel LSGW-1
Maximum Days Saturated-43
Groundwater Gauge
installed October 2, 2000.
Depth to Groundwater (in.)
Precipitation (in.)
Date
5
0
-5
-10
-15
-20
-25
-30
-35
-40
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
18-Mar-00
25-Mar-00
1-Apr-00
8-Apr-00
15-Apr-00
22-Apr-00
29-Apr-00
6-May-00
13-May-00
20-May-00
27-May-00
3-Jun-00
10-Jun-00
17-Jun-00
24-Jun-00
1-Jul-00
8-Jul-00
15-Jul-00
22-Jul-00
29-Jul-00
5-Aug-00
12-Aug-00
19-Aug-00
26-Aug-00
2-Sep-00
9-Sep-00
16-Sep-00
23-Sep-00
30-Sep-00
7-Oct-00
14-Oct-00
21-Oct-00
28-Oct-00
4-Nov-00
11-Nov-00
Precipitation
Depth to Groundwater
Required Depth


Lengyel LSGW-2
Groundwater Gauge
installed Oct. 2, 2000.
Maximum Days Saturated-43
Depth to Groundwater (in.)
Precipitation (in.)
Date
5
0
-5
-10
-15
-20
-25
-30
-35
-40
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
18-Mar-00
25-Mar-00
1-Apr-00
8-Apr-00
15-Apr-00
22-Apr-00
29-Apr-00
6-May-00
13-May-00
20-May-00
27-May-00
3-Jun-00
10-Jun-00
17-Jun-00
24-Jun-00
1-Jul-00
8-Jul-00
15-Jul-00
22-Jul-00
29-Jul-00
5-Aug-00
12-Aug-00
19-Aug-00
26-Aug-00
2-Sep-00
9-Sep-00
16-Sep-00
23-Sep-00
30-Sep-00
7-Oct-00
14-Oct-00
21-Oct-00
28-Oct-00
4-Nov-00
11-Nov-00
Precipitation
Depth to Groundwater
Required Depth

APPENDIX B

SITE PHOTOS

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6: Showing open water channel

Photo 7: Big Cordgrass